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Procedia Engineering 21 (2011) 1096 – 1103

**Procedia  
Engineering**[www.elsevier.com/locate/procedia](http://www.elsevier.com/locate/procedia)

2011 International Conference on Green Buildings and Sustainable Cities

## Assessing the potential of railway station redevelopment in urban regeneration policies: an Italian case study

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### Abstract

When we talk about urban sustainability, also mobility and transportation systems acquire a leading part to guarantee high levels of efficiency and livability of urban and metropolitan systems. Nowadays, railway transport networks represent essential frames to assure accessibility and reduction of traffic pollution and congestion, as well as they provide opportunities for urban regeneration. Recently, in Europe, railway stations have assumed a strategic role in urban redevelopments to provide efficient and livable urban and metropolitan systems but it's also necessary to have effective tools to achieve transport and urban goals at the same time. This paper illustrates an analytical and evaluation method to assess the renewal redevelopment potential of great rail stations and the spatial and urban regeneration opportunities that follow. The methodology has been implemented by its application to two Italian rail station redevelopments.

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Selection and/or peer-review under responsibility of APAAS

**Keywords:** railway stations; urban sustainability; urban regeneration; evaluating methodology

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### 1. Introduction

Today, reduction of soil consumption is considered the principle that mainly embodies the idea of urban sustainability. Thereby, urban regeneration and renewal are became the more common policies to manage spatial changes in a sustainable way.

When we talk about urban sustainability, also mobility and transportation systems acquire a leading role to guarantee high levels of efficiency and livability of urban and metropolitan systems. Transport networks are directed to increase urban and spatial quality [1], in fact they represent essential frames not

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only to guarantee practical functioning of urban life but they also represent developing opportunities for regions served by them. In this context, public transport networks have an outstanding role to assure accessibility and reduction of traffic pollution and congestion, as well as they provide opportunities for urban regeneration and revitalization.

In Europe, most recent city renewal plans have followed one another in the last decades and they have largely concerned railway areas. So they have stressed the strategic role of these areas as for other urban redevelopment situations in order to assure efficient and livable urban and metropolitan systems. In particular, railway stations are recovering an highlighting role they have already gained during the great nineteenth-century industrial development. This role allows them, on one hand, to connect quickly metropolitan central areas, which are now impenetrable by private vehicles, and, on the other hand, to support urban development models oriented to public railway transport systems, which are considered more sustainable in terms of pollution and energy consumptions. Finally, railway stations could be considered as emblematic places for urban sustainability.

Recent European development railway policies have shown themselves some behaviors as much interested towards city and its opportunities for a better promotion of railway transportation service. City has been recognized by the main European railway transportation companies as the driving force behind new economy and financial resources that are necessary to activate an important technical and administrative renewal process and to re-launch railway transportation service too. All that has assumed specific relevance on the occasion of the HST achievement.

Over the last few years, in Italy, these renewal processes have just been taking place. Similarly to what has already happened in many European cities, the Ferrovie dello Stato group (FS) is currently involved in the building of the first Italian HST stations requiring heavy structural interventions on various existing railway stations. These works are aimed at making the new stations as complex interchange nodes, which should be able to integrate different spatial scales and ways of transportation (from pedestrian to flying), and parts of city where highlighting function are located. Railway stations themselves are become the FS' real estate capital that is necessary to finance the infrastructural interventions, along with several railway areas, lines and buildings already abandoned (and situated in central zones) due to main reorganizational processes of passengers and freights transportation services. This scenario requires not to miss the great possibilities given by railway to the city in terms of improvement of urban sustainability levels. Therefore, it is crucial to provide tools which are able to systematize development foresights of railway transportation policies with existing urban and spatial demands. Also the more recent European interventions on railway areas reveal some difficulties to have a convergence between transport and infrastructural goals and urban development targets, in order to guarantee best physical and functional arrangements. So it's essential that urban planning identifies correct physical and functional arrangements for railway nodes, in order to achieve an efficient integration with other transport systems and surrounding urban areas. Therefore, integration appears the essential requirement to maximize benefits of railway station redevelopments, i.e. to accommodate development and transport opportunities with livable, safe and pleasant urban environments. Finally, guarantee of integration between city and railway means guarantee of urban sustainability.

This paper deepens the notion of integration between railway nodes and city, through the recognition of main renewal targets, collected among the main current European railway station redevelopments. Based on identified targets, the paper would propose an analytical and evaluation method to assess the renewal potential of redevelopment in great rail station transformations and the spatial and urban regeneration opportunities that follow. This methodology has been implemented by its application at two Italian case studies involved in transformation / new building interventions due to the introduction of HST devices. These are the old Bologna Central Station and the new Mediopadana HST external station near Reggio-Emilia.

## **2. Towards the building of an evaluation methodology to assess the potential of transformations**

### *2.1. The idea of integration between railway networks and physical spaces through railway nodes*

If we want to define what integration between railway networks and physical spaces would mean when we look at railway station redevelopments, firstly we have to remember the station is the meeting point of several transport networks. Each of them supports different relations between functions which identify a specific urban rank, and they affect areas which vary from local to global scale. Railway stations are physical places where relations, set up by networks, are transferred over the territory, showing connection's outcomes on it. By now, it's used to consider rail stations as nodes of transport networks and urban places at the same time [2] and we have to deal with their "double soul" to guarantee integration. In other words, they necessarily have to take charge of both negative effects, directly produced by rail infrastructures on the urban/spatial context, and critical situations intrinsic to urban/spatial context itself. Then integration seems to be possible if the territory is able "to support" and "to carry" the effects produced by a new transport system, resulting from the development of an existing railway service or the building of a new improved railway infrastructure. It means to reach a balanced situation, on one hand, between the demand of mobility coming from the local context and the transport role of the node and, on the other hand, between pressures and volumes of fluxes overflowed over the territory through the node and the node skill to absorb them. This balance establishes the railway station survival as a living place and a centre of a new urbanity, but it also guarantees a growing urban and socio-economic quality. As a matter of fact, if the local context isn't able to provide mobility demand and economic dynamics updated to link chances offered by new transport configurations, then the station area itself is likely to fail all the development perspectives offered by the new infrastructural configuration. At the same time, the city has to be able to absorb the growth of mobility and location demand caused by the rising of accessibility through an overall urban configuration which could reduce conflicts and congestion. This balance should be pursued from spatial to urban and neighborhood scales.

### *2.2. Goals and strategies to achieve integration between railway station and urban environment*

The idea of integration has been understood through recognition of some design goals and best practices: the former are aimed at mediating between transport and urban needs in the space of train station, the latter are oriented to manage in a good way the urban and infrastructural development and the coordination among involved actors. The first detected goal, pertaining the node's transport sphere, is the guarantee of a seamless journey inside an high quality space [3]. This means highest reduction of linking time and paths by facilitating interchange among the different means of transport (public or private, motorized or cycle and pedestrian) that converge on the railway node. This first aim should be possible thanks to an efficient organization of interchanges inside the railway station, good functions, good aesthetic choices and seamless paths between the station and the surrounding areas [4]. The second goal concerns the role of urban centrality the train station could perform both in central parts of the city and in suburban areas, where requirements of setting up new meaning places are strong. This means the station should become a part of the city [5] through a development of mixed-use environments and services inside and around the station [6] which could fulfill the needs of passengers and city users but also the needs of local inhabitants. A further goal in the redevelopment of railway stations is the promotion of security measures to make stations themselves more livable. This implies a promotion of new forms of collaboration between local governments and railway companies to raise the bad quality of station's environments, to work out social problems that occur inside the station, and to reduce insecurity through a right design of spaces [7] [8] and formal surveillance devices.

As mentioned above, to achieve the identified objectives and then to have higher chances of success, measures and tools, which are able to manage the urban and infrastructural development, are required. They should also be based on a multi-scale and multi-field planning [9] and they should make use of public-private-community partnerships that clearly define good stakes and compensations [10].

### 2.3. The construction of the evaluation grid

After detection of right goals and procedures that underlie railway station developments, an evaluation grid, which assesses the potential of urban transformation, has been built. This tool allows, on one hand, to systematize different strategies that are often developed individually and, on the other hand, to provide an overall qualitative assessment of transformation performances.

The evaluation grid is based on four main strategies, gathered by the goals detected before. They are:

- Node statement (MS1),
- Creation of urban and peri-urban centralities (MS2),
- Promotion of urban security and social inclusion (MS3),
- Transformation process feasibility and control (MS4).

Then, each main strategy has been declined and more specified through the following standards:

- Specific strategies, describing the goals subtended to the main strategies in a more detailed way;
- Requirements, that specify targets of each specific strategy by defining general performances to satisfy;
- Measures/actions that allow to translate requirements (therefore the specific strategies too) in implementing choices.

The assessing part of the proposed methodology is based on both the grid of parameters just described above and a scale of value scores (0: absent; 1: lacking; 2: present; 3: excellent (project strength)) to be assigned to each requirement. These value scores allow to assess the goodness of adopted measures in order to increase each requirement's performance and, consequently, to evaluate the fulfilment of each specific strategy.

Table 1. Application scheme of evaluation methodology

MS1: Node statement			
Specific strategies	Requirements	Measures/actions	Scores
Efficiency of interchange	Seamless of journey inside the station during the change among different means of transport	No interferences among interchange (faster) paths, walking (slower) paths and waiting/rest areas; effective signage; short distances among interchange nodes	0-3
Good station integration inside the surrounding areas	Joining between station areas and city through nice paths	High pedestrian station accessibility; station areas and paths designed as urban spaces (street/square)	0-3
Intermodality level provided	Good presence of means of transport in relation to the station rank and directly connected to the station	Public bike/car parking facilities; public transport terminals/stops; direct links with airport/port (if requested by the station hierarchy level) and the city centre (for external stations)	0-3

MS2: Creation of urban and peri-urban centralities			
Specific strategies	Requirements	Measures/actions	Scores

Station identity and recognition level inside the urban environment	Station design as a typical urban place for inhabitants, city users and passengers	High architectural quality; no enclosures or barriers; enhancement of local place identity	0-3
Functional integration between station and city	Providing private uses and public services in order to increase the neighborhood liveableness	Design balanced mixed-use environments to contain congestion and monofunctional; providing lacking services and facilities	0-3
Balanced function choice inside the station	Providing right function and facility mixes in order to supply passengers, city users and inhabitants' needs	High level of travel services and facilities (waiting rooms, info points, ticket offices, working rooms, wifi, etc.); right level of retail stores compared to the node efficiency	0-3
MS3: Promotion of urban security and social inclusion			
Specific strategies	Requirements	Measures/actions	Scores
Increasing of passengers 'feeling of security all day long	Ensuring informal and formal surveillance	CCTV devices, security staff, real time information to passengers, encouraging the presence of retailers during the day, good design of physical environment	0-3
Creating a sense of belonging	Use involvement actions allowing citizens to feel station like an homely place	Happening and festival promotion, participatory planning labs	0-3
Promote social inclusion	Providing social assistance staff and spaces inside the station	Counselling centers, street units, urban security pilot project, etc.	0-3
MS4: Transformation process feasibility and control			
Specific strategies	Requirements	Measures/actions	Scores
Promoting multi-scale and multi-field planning approach	Coordination among spatial, urban and neighborhood planning, coordination between general and sectoral planning	More coherence between: strategic goals and implementing procedures, rail and urban policies, urban development and financial plans	0-3
Promoting development decisions shared with urban communities	Consensus making and wide involvement of public and private stakeholders	Promoting design/idea competitions; public consultation and design	0-3
Increasing public spaces and facilities and urban sustainability	Achieving a good balance between private assets and public equipments realized during the development	High negotiation skill of the local government; good balance between public capture of value and incentives given to private owners; balanced public and private investments	0-3

Outcomes of assessment can be effectively summarized in a graph where any gap between each main strategy value and its peak can be immediately detected: the higher is the gap, the clearer is how much design choices and measures couldn't achieve strategy goals. Graphs also summarize effectiveness of the overall transformation, which could be also defined as urban regeneration potential (URP). In the graphs, URP is represented by the extent of the area that is defined by the junction lines between score points on each axis.

### 3. Applying the evaluation methodology to Bologna and Reggio-Emilia HST stations

Evaluation methodology has been applied to two ongoing Italian HST station developments. Analyzing ongoing examples has allowed, on one hand, to verify the right of development procedures already selected and, on the other hand, to evaluate first outcomes of the two case studies. The first example is the redevelopment of the old Bologna Central Station where the HST train will stop, whereas the second one is the new building of the Mediapadana external HST station, near Reggio-Emilia. Either

of them represent two different city-station relationships and as many urban development patterns which have unlike impacts, so they could be representative samples of Italian reality. Bologna Central Station is an historic railway node located in a central position, which is converting itself in an high-powered intermodal transport node. Consequently, it is determining a massive urban transformation with heavy rebounds to the whole city. The related environment, referring to a metropolitan scale, has a strong aptitude to develop international relationships, thanks to important road, rail and air connections servicing it. Instead, the Mediopadana station is a case of a new HST station, located in a peri-urban area, near the midsize city of Reggio-Emilia. The new station is a great opportunity to rethink the shape of surrounding areas affected by sprawl phenomenon through new physical and functional settings. The Mediopadana station also represents a great challenge which the territory has to face: it will have to guarantee high transport demand levels to sustain the new HST service. Actually the new station is now affected by a lack of certain physical and functional development programs regarding the surrounding areas [11] and moreover it could be sensitive to likely competition with other nearby cities.

Table 2. Assessing scheme of the two case studies

MS1: Node statement	Bologna	Reggio-E.
Efficiency of interchange	2	2
Good station integration inside the surrounding areas	3	2
Provided intermodality level	3	2
Total (0-9)	8	6
MS2: Creation of urban and peri-urban centralities	Bologna	Reggio-E.
Station identity and recognition level inside the urban environment	1	2
Functional integration between station and city	2	2
Balanced function choice inside the station	3	0
Total (0-9)	6	4
MS3: Promotion of urban security and social inclusion	Bologna	Reggio-E.
Increasing of passengers' feeling of security all day long	2	1
Creating a sense of belonging	0	2
Promote social inclusion	2	0
Total (0-9)	4	3
MS4: Transformation process feasibility and control	Bologna	Reggio-E.
Promoting multi-scale and multi-field planning approach	3	2
Promoting development decisions shared with urban communities	3	2
Increasing public spaces and facilities and urban sustainability	3	3
Total (0-9)	9	7

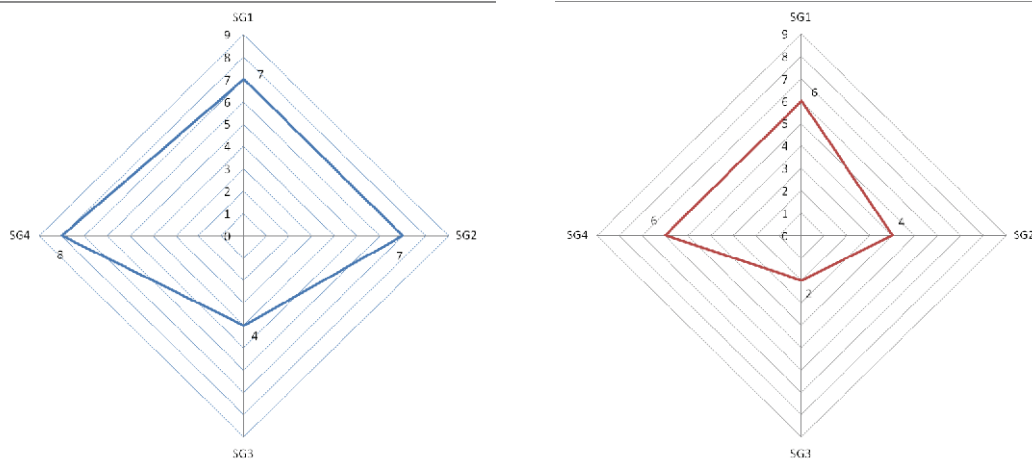


Fig. 1. Graphs showing Bologna (left) and Reggio-Emilia (right) evaluation outcomes

### 3.1. Bologna case study

As showed in the graph too, development evaluation of Bologna Central Station has basically stressed a fairly high URP and a good achievement of targets at the base of MS1 and MS2 strategies. The highest performances have been detected in regard to transformation control procedures, thanks to a coordinated, coherent and shared planning which maybe represents the strength of the urban and infrastructural station development. Instead, the MS3 strategy is the one that has showed the less effective measures. By looking at the performance of each single specific strategy, some critical situations have been stressed, also inside that main strategies which have achieved overall high performances. An emblematic example is given by the lack of right design solutions to create pleasant environments inside the station, especially in some interchange paths and station-city connections developed underground, without any relationship with the outside environment.

### 3.2. Reggio Emilia case study

The purpose to develop the Mediopadana HST station in Reggio-Emilia territory seemed to be immediately a risky challenge and starting outcomes have confirmed this forecast. Detected problems are mainly due to a lack of certain actions and measures to draw the urban centrality role of the station and to guarantee urban security and social inclusion, despite the station construction site seems to be near to begin. An approved masterplan that clearly defines physical and functional development of station neighborhood is still missing. Furthermore, the region hasn't many leading functions and services that could provide enough mobility fluxes trough HST station, which could direct towards reliable development opportunities. Also the little presence of retail functions and services currently provided inside the station preludes to urban security problems and low vitality of node environments, making the station a degraded place even before its opening. Instead, the best performances are related to the node statement, the real core of development. This is a crucial outcome since the Mediopadana station was born to primarily achieve these kind of goals. Also process control has produced quite high effectiveness levels and this works in favor of success of urban development.



#### 4. Conclusions

The proposed methodology has seemed to be a useful and a easy-to-use assessment to give a synthetic evaluation about the goodness of policies and actions to achieve a better configuration of developing urban context. It has also allowed to evaluate different targets (transport, urban, social, etc.) inside a common scheme. Actually, graphs provide an overall and immediate picture about the effects of adopted strategies: the more the area is wide, the more the assumed measures guarantee satisfying and balanced outcomes as a whole. A right reading of evaluation's outcomes must also consider the scores assigned to each specific strategy, to establish which requirements and measures have produced low shining results and consequently to identify the relative causes and specific improving interventions. Moreover, methodology statement based on strategies' performance is more flexible and repeatable.

Finally, the opportunity to have a synthetic view about effectiveness of each adopted development strategy, considered as a whole, stresses the need to achieve a greater integration among urban and transportation policies, expertises and roles of involved actors, different phases of development. Each of these issues is faced too often by a low coordinated way, instead they are vital to make railway stations as emblematic places in order to guarantee a new urban sustainability.

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